# PATENT SPECIFICATION

DRAWINGS ATTACHED

937,644

937,644

*Date of Application and filing Complete Specification March 21, 1962.*

*No. 10753/62.*

*Application made in Austria (No. A2377) on March 23, 1961.*

*Complete Specification Published Sept. 25, 1963.*



Index at acceptance:—Class 83(4), E3(B:F:M:P).

International Classification:—B23k.

COMPLETE SPECIFICATION

## Improvements in or relating to Machines for the Manufacture of Compression Spring Strips from Wire, for example for Upholstery Inserts

I, WILLI GERSTORFER, of 8 Glasnegg, Grödig bei Salzburg, Land Salzburg, Austria, an Austrian citizen, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a machine for the manufacture of a compression spring strip which consists of a continuous wire of steel or the like and serves for the formation of spring inserts for cushions and the like and in which each right-hand compression spring coil is followed with the interposition of a connection portion by a left-hand compression spring coil approximately parallel to the right-hand compression spring coil and so on alternately.

The invention is intended to provide such a machine which avoids the disadvantages of known machines by eliminating the need for manual work and providing a storage arrangement for the compression spring strip.

Such a machine according to the invention is characterised in that the tools serving for the shaping of the wire, inclusive of tools for producing the curvature of the wire and for determining the amount and direction of the lead of the coils, are arranged in a shaping head which is pivotally movable in relation to the direction in which the spring strip is drawn off, and that the movable tools serving for shaping the wire are coupled with the drive means for the pivotal movability of the shaping head in synchronism.

Further and optional features of the invention appear from the following description and the appended claims.

A machine in accordance with the invention is illustrated partly diagrammatically and by way of example in the accompanying drawings, in which

Fig. is a diagrammatic side view of the machine,

Fig. 2 is a side view illustrating the shaping head, and

Fig. 3 illustrates the hooking together of the spring coils in the completion of the compression spring strip.

The illustrated machine comprises a shaping head 1 mounted by means of two bearing plates 2 for pivotal movement about an axis 4. The shaping head 1 is provided in its lower end portion with a shaft 5, which is rotatably mounted and supported by the bearing plates 2. The upper end of the shaft 5 is continued by a hook-shaped wire guide, which consists of two firmly connected parts, namely, an inner arcuate member 9 and an outer arcuate member 6. The shaft 5 is formed with a central longitudinal bore, which slidably receives the wire. This bore is continued by a passage defined by and between the arcuate members 6 and 9 and terminating at the outlet 8. A U-shaped bracket or support 7 is rigidly connected to the shaft 5 and the arcuate members 6 and 9 and provides bearing means for the linkage for the bending roller and the lead pocket, which linkage will be described hereinafter. A sleeve 10 is axially slidably mounted on the shaft 5. It carries an upwardly extending rod 11, which is axially slidably mounted in the bracket 7 and has pivoted to its upper portion at 12 another rod 13, the upper end of which is pivotally connected by a pivot 14 to one arm 15 of a bell-crank lever pivoted to the arcuate member 9 at 17. A bending roller 18 is rotatably mounted in the other arm 16 of the bell-crank lever. The sleeve

10 comprises a flange 19 extending at right angles to the shaft 5. A segment of this flange 19 rests on a roller 20, i.e. a surface of a solid of revolution, which is mounted for rotation about a substantially horizontal axis 21 on a vertically movable member 22 of a linkage, which is not shown in more detail. On its side opposite to the outlet 8, the sleeve 10 carries a protruding arm 23, which is urged toward a stationary arm 25 by a tension spring 24.

The bracket 7 is formed with a vertical bore 26 which is spaced a larger distance from the axis 4 than the rod 11. A shaft 27 is rotatably but axially nondisplaceably mounted in this bore 26. This shaft 27 carries at its upper end a pocket 28 consisting of two identical plates, which define a space between them. The two plates are interconnected at their top end and have a pin 31 welded to them, which is rotatably mounted in a bearing sleeve 32 disposed near the end of the outer arcuate member 6.

At its lower end, which freely protrudes below the bracket 7, the shaft 27 carries a screw member 33 having a relatively great lead.

The upper limb 36 of two parallel limbs 36, 38 of a U-shaped bracket 37 carries two horizontally extending rollers 34, which cooperate with the screw member 33 like two half nuts. The limbs 36 and 38 are a sliding fit on the sleeve 10 and the shaft 5, respectively. The lower limb 38 carries a disc-shaped portion extending at right angles to the shaft, and a segment of this disc-shaped portion rests on a roller 39, i.e., a surface of a solid of revolution, which is mounted on a member 40 of a vertically movable linkage not shown in more detail. A tension spring 48 is connected to a protruding lug 41 of the bracket 37 and the lower end of this tension spring is hooked on the stationary arm 25 so that this spring tends to pull the bracket 37 downwardly. Before the lower end of the tubular shaft 5, two feed rollers 42 for the wire 43 to be bent are provided. A rotation of the shaping head 1 about its axis 4 is effected by a sprocket wheel 44, which is secured above the lower bearing 2 to the shaft 5 and which can be rotated through an angle of up to 90° in both directions by a chain 45 driven by suitable means, not shown, which are operated to cause the shaping head to perform a pivotal movement about its axis 4.

The wire 43 from which the compression spring strip is to be manufactured is fed from a capstan 46 to the rolls 42, which feed the wire into the interior of the shaft 5. The wire is then guided through the hook-shaped member 6, from which it emerges at 8. Below the outlet 8 the bending roller 18 imparts to the wire 43 a more or less pronounced curvature, depending on the position of the outlet 8, which can be adjusted by an upward or downward movement of the sleeve 10. A lead can be imparted to the emerging wire by a rotation of the pocket 28 relative to the shaping head 1. Thus all desired shapes can be imparted to the wire portion and nevertheless the compression spring strip manufactured leaves the shaping head 1 always in one and the same direction.

To manufacture the compression spring strip shown in the present example, the wire 43 must be bent so that a right-handed convoluted compression spring having 2 1/2 turns is continued by a U-shaped connecting portion and then by a left-handed convoluted compression spring having 2 1/2 turns, which is again followed by a U-shaped connecting portion. This results in the formation of a compression spring strip having trapezium-shaped waves, the U-shaped connecting portions extending in the longitudinal direction of the compression spring strip and the left- and right-handed compression springs forming the oblique sides of the trapeziums. The limbs of the U-shaped connecting portions should desirably include angles exceeding 90° with the cross pieces because this will provide for the initial stress required for hooking. Fig. 3 is a diagrammatic view of such a compression spring strip coming out of the shaping head and the manner in which the individual compression springs of said strip are hooked together, $81, 81^1, \ldots$ are right-handed compression springs, $82\ 82^1, \ldots$ are succeeding connecting portions, $83, 83^1, \ldots$ are left-handed compression springs and $84, 84^1, \ldots$ are succeeding connecting portions.

When it is desired to vary the curvature of the wire, the linkage member 22 is caused by suitable control means to move up and down in synchronism with the pivotal movement of the shaping head. This will also cause an up and down movement of the sleeve 10 and the rod 11 secured to it. An upward movement of the rod 11 will cause a forward movement and a downward movement of the rod will cause a rearward movement of the roller 18.

The up and down movement of the linkage member 40 causes an up and down movement of the bracket 37. By means of the rollers 34, this causes a rotation of the screw 33 and of the pocket 28 so that the angle between the emerging wire and the shaping head 1 can be changed.

Thus the movable tools 6, 9, 18 and 28 serving for shaping the wire are coupled with the drive means 44, 45 for the pivotal movability of the shaping head 1 in synchronism.

The individual turns of the compression spring strip may then be hooked together by means of a device which is indicated in Figs. 1 and 3 but does not form a part of the present invention. The initial stress which

is due to the trapezium shape of the compression spring strip will always ensure that the compression springs engage each under an appropriate stress. A modified device may be subsequently arranged when it is desired to manufacture spring strips of different type, e.g., spring strips in which the turns are interlaced rather than hooked together.

The manufactured compression spring strip can be stored by winding it on a reel 47.

Various modifications are possible within the scope of the invention. This applies particularly to the means for driving the various elements.

WHAT I CLAIM IS:—

1. A machine for the manufacture of a compression spring strip which consists of a continuous wire of steel or the like and serves for the formation of spring inserts for cushions and the like and in which each right-hand compression spring coil is followed with the interposition of a connection portion by a left-hand compression spring coil approximately parallel to the right-hand compression spring coil and so on alternately, the machine being characterized in that the tools serving for the shaping of the wire, inclusive of tools for producing the curvature of the wire and for determining the amount and direction of the lead of the coils, are arranged in a shaping head which is pivotally movable in relation to the direction in which the spring strip is drawn off, and that the movable tools serving for shaping the wire are coupled with the drive means for pivotal movability of the shaping head in synchronism.

2. A machine according to claim 1, characterized in that the wire guide initially extends approximately in the middle of the pivotal axis of the shaping head and then extends in known manner along an arc relative to said axis, and that a bending roller, known *per se*, is disposed in an adjustable position at the outlet end of the wire guide.

3. A machine according to claim 2, characterised in that the bending roller is arranged on a linkage which is axially displaceable in the direction of the pivotal axis of the shaping head and comprises a surface of a solid of revolution having an axis lying in the pivotal axis of the shaping head, on which surface of a solid of revolution acts an adjusting member which is adjustable in a direction which is substantially parallel to said pivotal axis of the shaping head.

4. A machine according to any one of claims 1 to 3, characterised in that the tool serving for imparting the lead is constructed as a pocket in the form of two spaced parallel plates or the like, which are pivotally mounted in a support connected to the shaping head.

5. A machine according to claim 4, characterised in that the pocket is pivotally movable through the intermediary of transmitting means, such as for example a screw of steep pitch together with moving nuts, by a drive member which is displaceable parallel to the axis of the shaping head and which comprises a surface of a solid of revolution having an axis lying in the pivotal axis of the shaping head, which surface of a solid of revolution is engageable by an adjusting member which is adjustable in a direction which is substantially parallel to the pivotal axis of the shaping head.

6. A machine according to any one of claims 1 to 5, characterised in that inserted after the shaping head is a device for hooking each compression spring to the preceding one and suited in its working movements to the production output of the shaping head.

7. A machine according to claim 6, characterised in that a winding drum or like storage arrangement is arranged following the device for hooking.

8. A machine for the manufacture of compression spring strips, substantially as described hereinbefore with reference to and as shown in Figs. 1 and 2 of the accompanying drawings.

9. A compression spring strip comprising right-handed compression springs and left-handed compression springs in alternation, whenever manufactured by a machine as claimed in any of claims 1 to 8.

HANS & DANIELSSON,
Chartered Patent Agents,
12, Lodge Lane, London, N.12.

Leamington Spa: Printed for Her Majesty's Stationery Office by the Courier Press.—1963.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

Fig. 1

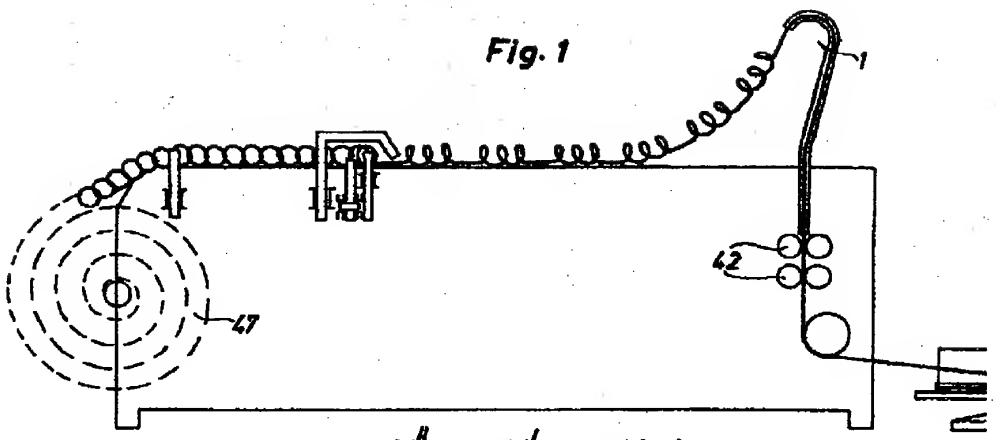
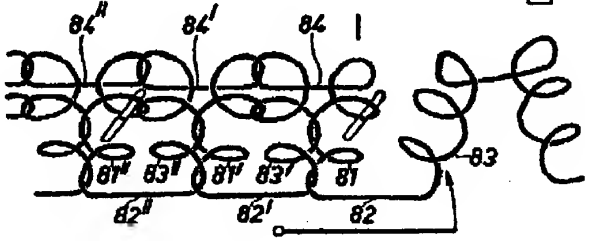
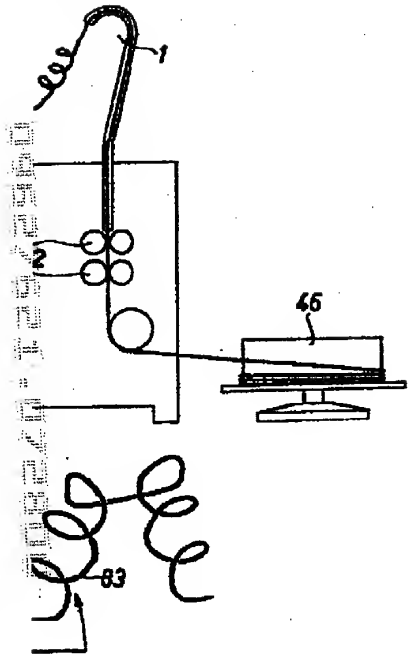



Fig. 3



937,644 COMPLETE SPECIFICATION
2 SHEETS

This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2



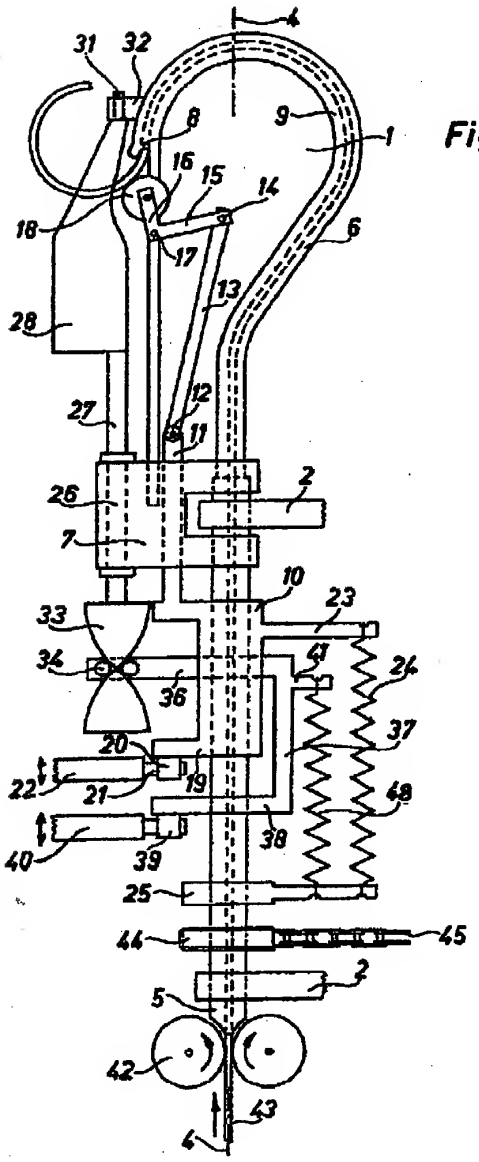




Fig. 2

937,644 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2

Fig. 2

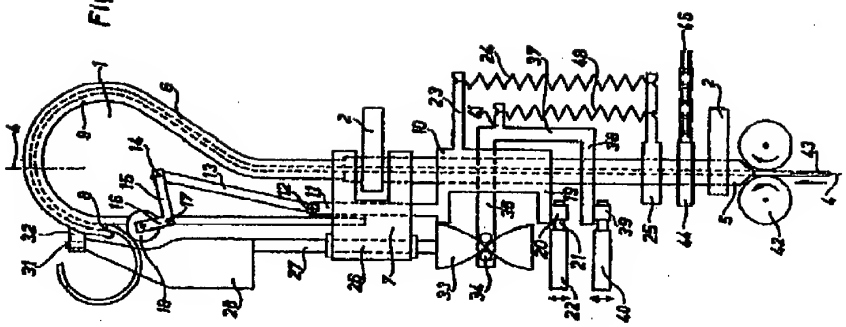


Fig. 1

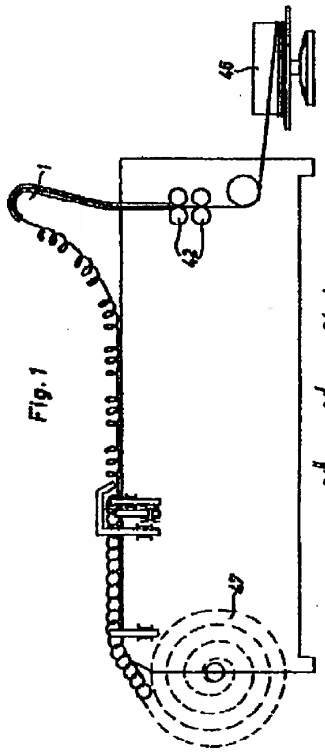


Fig. 3